



REMARKS

Drawings

Applicant includes herewith formal drawings that are suitable for reproduction.

Election/Restrictions

During a telephone conversation with the Examiner on September 23 and 24, 2002, to discuss the restriction requirement of the Examiner under 35. U.S.C. § 121, Mr. Bernadicou (George Chen) had made a provisional election without traverse to prosecute the invention of Group I, claims 1-12, drawn to an apparatus, classified in class 156, subclass 345.

Consequently, the Examiner had withdrawn the invention of Group II, claims 13-17, drawn to a method, classified in class 438, subclass 9, from further consideration by the Examiner, under 37 C.F.R. 1.142 (b), as being drawn to a non-elected invention.

In response to the request by the Examiner in the Office Action mailed on October 3, 2002, Applicant hereby affirms the election to prosecute Group I claims, claims 1-12, and cancels Group II claims, claims 13-17.

Claim Rejections 35 U.S.C. § 102 (b)

The Examiner has rejected claims 1-12 under 35 U.S.C. §102 (b) as being anticipated by Casey, Jr. et al. (US 6,042,738).

Applicant respectfully disagrees with the Examiner. The cited reference of Casey, Jr. et al. teaches a focused ion beam (FIB) system (10) to mill excess material. See lines 4-7 in Col. 4 and Figure 1. The FIB system includes an ion column (12), see lines 45-46 in Col. 4, a charge neutralization element (32), see line 4 in Col. 5, a secondary particle detector (28), see lines 5 in Col. 5, and a fluid delivery conduit (44), see lines 23-24 in Col. 5.

Scanning a focused beam of ions over a mask with the apparatus of Casey, Jr. et al. will physically sputter away exposed portions of the surface of the mask. See lines 25-28 in Col. 1. When a gas is directed at the surface of the mask during FIB etching, the process is referred to as gas-assisted etching (GAE). See lines 58-60 in Col. 1.

In contrast, Applicant's invention envisions an apparatus to repair an opaque defect on a DUV or EUV mask by using electron beam-induced chemical etching. See lines 6-8 on page 12 of the specification and Figure 4. The apparatus (400) includes an imaging system (440), that may include an electron column, to locate an opaque defect (405) on the mask (410). See lines 12-14 on page 12 of the specification.

The apparatus (400) also includes a gas delivery system (450) to dispense one or more gases from reservoirs, through one or more openings, such as nozzles, towards the opaque defect (405). See lines 15-17 on page 12 of the specification.

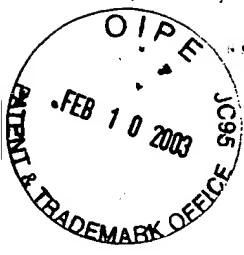
The apparatus further includes an electron delivery system (460) to direct electrons towards the opaque defect (405). See lines 1-2 on page 14 of the specification. The electron delivery system (460) may resemble an electron column used to image a sample in a SEM except that the focusing and scanning controls for the electron beam are more sophisticated. See lines 23-25 on page 13 of the specification.

Electron beam-induced chemical etching has high selectivity to underlying layers because it is essentially chemical, unlike FIB or GAE, which always has a physical component due to the ion bombardment. Unlike with the ion beam in FIB, an electron beam will not damage underlying layers by ion implantation or by knock-on of atoms. See lines 23-27 on page 9 of the specification.

Casey, Jr. et al. teaches an apparatus to use ions to perform sputtering, but does not teach an apparatus that uses electrons to induce chemical etching. Thus, the cited reference of Casey, Jr. et al. does not anticipate claims 1-12 of Applicant's claimed invention since Casey, Jr. et al. does not teach each and every element of Applicant's claimed invention.

In view of the foregoing, Applicant respectfully requests the Examiner to withdraw the rejections to claims 1-12 under 35 U.S.C. §102 (b).

Applicant believes that all claims pending, including claims 1-12, are now in condition for allowance so such action is earnestly solicited at the earliest possible date.



VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. (Once Amended) An apparatus comprising:
 - a holder adapted to mount a substrate;
 - a stage adapted to position said holder in a chamber;
 - a pumping system adapted to evacuate said chamber;
 - an imaging system adapted to locate an opaque defect in said substrate;
 - a gas delivery system adapted to dispense a reactant gas towards said defect; and

an electron delivery system adapted to direct electrons towards said opaque defect and induce etching by said reactant gas.

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